

REMARKS

Claims 1-18 are currently pending in the present application, with claims 1 and 7-8 being written in independent form. Claim 1 has been amended to include the limitations of claims 19-20. As a result, claims 19-20 have been cancelled without prejudice or disclaimer. Claims 7-8 were previously withdrawn from consideration. Thus, the present amendments neither involve new matter nor require further search and/or consideration.

Claims Objections

Claim 19 stands objected to because of an informality. In particular, the Examiner suggests amending the word “radiated” to recite “irradiated.” This objection has been rendered moot by the present amendment. Accordingly, Applicants respectfully request the Examiner to withdraw this objection.

Claim Rejections under 35 U.S.C. § 112

Claim 20 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner states that there is “no *literal* support in the specification for the newly added claim 20.”¹ Applicants respectfully traverse this rejection for the reasons below.

There is no *in haec verba* requirement with regard to newly added claim limitations. Rather, the limitations may be supported in the specification through express, *implicit*, or *inherent* disclosure.²

¹ Final Office Action (12/10/2009): p. 4, last 2 lines.

² MPEP 2163(I)(B)(2nd par., 1st sentence).

Based on Applicants' teachings in the specification regarding the oxygen atmosphere, one of ordinary skill in the art would readily appreciate that Applicants had possession of the claimed invention at the time the application was filed. In any event, this rejection has been rendered moot by the present amendments. Accordingly, Applicants respectfully request the Examiner to withdraw this rejection.

Claim Rejections under 35 U.S.C. § 103 (Yudasaka + Bokova + Irle + Howard)

Claims 1-6 and 9-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over "*Diameter-Selective Removal of Single-Wall Carbon Nanotubes Through Light-Assisted Oxidation*," Chemical Physics Letters (June 4, 2003), Vol. 374, Issues 1-2, pp. 132-136 (Yudasaka) in view of "*Laser-Induced Effects in Raman Spectra of Single-Wall Carbon Nanotubes*," Quantum Electronics (July 31, 2003), Vol. 33, No. 7, pp. 645-650 (Bokova), "*Theoretical Study of Structure and Raman Spectra for Models of Carbon Nanotubes in Their Pristine and Oxidized Forms*," J. Phys. Chem. A (2002), Vol. 106, pp. 11973-11980 (Irle), and US 7,396,520 (Howard). Applicants respectfully traverse this rejection for the reasons below.

Without conceding as to any of the Examiner's assertions that are not specifically addressed herein, Applicants note that the combination of Yudasaka, Bokova, Irle, and Howard fails, as a preliminary matter, to disclose or suggest a method of structure control involving "irradiating the mixture of nano-scale low-dimensional quantum structures of differing densities of states with an electromagnetic wave in **air**," as recited by amended claim 1.

Rather, Yudasaka clearly teaches that the single-walled carbon nanotubes (SWNTs) are irradiated "[w]hile being mixed with the H₂O₂ solution" so as to *remove*

single-walled carbon nanotubes of certain diameters.³ To remedy this acknowledged deficiency of Yudasaka, the Examiner attempts to rely on the teachings of Howard.⁴ However, although Howard discloses various oxidants (e.g., “pure O₂”), it should be noted that the oxidants are taught with regard to “fullerenes *synthesis*” (as opposed to fullerene *removal*).⁵ Because the **removal** of single-walled carbon nanotubes as taught by Yudasaka is the complete opposite of the **synthesis** of fullerenes (e.g., single-walled carbon nanotubes⁶) as taught by Howard, there is no credible reason why one of ordinary skill in the art would have been motivated to modify the nanotube **removal** method of Yudasaka so as to more resemble the nanotube **synthesis** method of Howard. Furthermore, the additional teachings of Bokova and Irle fail to remedy the deficiencies of Yudasaka and Howard.

The combination of Yudasaka, Bokova, Irle, and Howard also fails to disclose or suggest a method of structure control involving “irradiating the mixture of nano-scale low-dimensional quantum structures of differing densities of states with an electromagnetic wave in air **for two hours**,” as recited by amended claim 1. Rather, Yudasaka explicitly states that when the irradiation lasted “*longer than 5 min.* diameter-selective removal through light irradiation was not apparent.”⁷ Thus, it is clear that Yudasaka actually teaches away from Applicants’ claimed irradiation period. Furthermore, the additional teachings of Bokova, Irle, and Howard fail to remedy the deficiencies of Yudasaka.

³ Yudasaka: p. 133, left col., ln. 18-19; p. 135, right col., Discussion.

⁴ Final Office Action (12/10/2009): p. 8-9.

⁵ Howard: Abstract; col. 6, ln. 56 – col. 7, ln. 7.

⁶ Howard: col. 2, ln. 50-51.

⁷ Yudasaka: p. 135, right col., last par.

The Examiner also acknowledges that Yudasaka *fails* to disclose an “energy density of **10 kW/cm²**” but nevertheless asserts that Bokova remedies this deficiency.⁸ Applicants respectfully disagree.

Although Bokova discloses various energy densities, the method of Bokova and that of claim 1 fundamentally differ in principle. In particular, the method of Bokova was not designed to have any relation to the density of states of carbon nanotubes. For instance, Bokova discloses a relationship between beam energy density and carbon nanotube diameter in section 3.2 but fails to disclose a relationship with regard to density of states. As a result, unlike the cited art, the claimed method enables the selective removal of semiconductor *and* metallic carbon nanotubes based on the density of states resonating with the electromagnetic wave. As evidenced by Applicants’ FIG. 7(a), the Raman shifts of 140-210 cm⁻¹ (corresponding to semiconductor carbon nanotubes) and 240-260 cm⁻¹ (corresponding to metallic carbon nanotubes) decreased in strength after irradiation in accordance with Applicants’ method. In contrast, the method of Yudasaka lacks the selectivity of claim 1, as evidenced by the inability of the method of Yudasaka to remove metallic carbon nanotubes.⁹

For at least the reasons above, a *prima facie* case of obviousness cannot be established with regard to claim 1. Consequently, a *prima facie* case of obviousness also cannot be established with regard to claims 2-6 and 9-18, at least by virtue of their dependency from claim 1. The rejection with regard to claims 19-20 has been rendered moot by the cancellation of those claims. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw the above rejection.

⁸ Final Office Action (12/10/2009): p. 7, ln. 5-6; p. 9, section e.

CONCLUSION

In view of the above, Applicants respectfully request the allowance of all the pending claims in the present application.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. §1.17; particularly, extension of time fees.

Respectfully submitted,

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By


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⁹ Yudasaka: p. 135, section 3.2 ("the number ratio of the *metallic* SWNTs increased").